NIH Public Access
Author Manuscript
Stroke. Author manuscript; available in PMC 2013 December 01.

Published in final edited form as:
Stroke. 2012 December ; 43(12): 3399–3401. doi:10.1161/STROKEAHA.112.662536.

Impact of an EMR-based Clinical Decision Support Tool for Dysphagia Screening on Care Quality

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Abstract

Background—Dysphagia screening (DS) prior to oral intake in acute stroke patients is a hospital level performance measure. Herein, we report outcomes of an initiative to improve compliance to this quality measure.

Methods—Design was a pre vs. post-intervention comparison study. Intervention was an Electronic Medical Record (EMR) based Clinical Decision Support system (CDS) embedded within stroke admission orders. The CDS was designed to facilitate DS in stroke patients. Primary outcome was compliance to a process measure in ischemic stroke patients: performance of a swallow screen prior to oral intake.

Results—DS measure compliance increased from 36% to 74% (p=0.001). Chart audits found screened patients were more likely to have CDS-embedded admission orders initiated or stroke unit admission.

Conclusion—The EMR offers a ready platform for CDS implementation. DS is a difficult performance measure to improve. The described CDS has the potential for improving performance on this challenging care quality measure.

INTRODUCTION

Post-stroke dysphagia occurs in 29 to 78% of stroke patients and is associated with increased risk of pneumonia, hospital readmissions and increased mortality.[1] Guidelines recommend dysphagia screening for acute stroke patients and referral to speech/language pathologists for those with abnormal results.[2] Dysphagia screening in acute stroke patients prior to oral intake is a hospital level performance measure in nationwide stroke care quality improvement (QI) programs including the Paul Coverdell National Acute Stroke Registry (PCNASR).[3] This measure is defined as: “Percentage of ischemic and hemorrhagic stroke patients who undergo a screen for dysphagia using a simple, valid bedside testing protocol before receiving any food, fluids or medication by mouth.”

Disclosures None

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In the Minnesota Stroke Registry (MSR), (part of PCNASR), while overall care quality was high, performance on the dysphagia screening measure was low for ischemic strokes (range, 30-60%) and still lower for hemorrhages. Herein, we report outcomes of a focused QI initiative addressing compliance to the dysphagia screening measure at one registry hospital.

METHODS

Design

A pre vs. post-intervention comparison design was used. The intervention was an Electronic Medical Record (EMR) based Clinical Decision Support system (CDS) embedded within the stroke admission orders. Intervention goal was dysphagia screening performance measure (DSPM) compliance improvement.

Data

Data were obtained from the MSR, a statewide stroke care QI program overseen by the Minnesota Department of Health currently enrolling 52 hospitals. The study hospital was a registry participant. (Online Supplement describes data collection).

Subjects

Included were stroke patients, ≥18 years, discharged between January 1, 2009 and December 31, 2011. Excluded were patients remaining NPO (nothing by mouth) throughout hospitalization and patients unable to undergo dysphagia screening (e.g. intubated throughout hospitalization).

Outcomes

Primary outcome was DSPM compliance, defined as performance of a swallow screen prior to any oral intake. At the study hospital, ischemic stroke patients were admitted to the neurology service where stroke admission orders with the CDS was used. Hemorrhagic strokes were typically admitted to surgical services where order sets did not include the CDS. Hence, we primarily examined the intervention effect in ischemic stroke patients. DSPM compliance in hemorrhagic stroke patients was examined to identify secular trends in care quality.

DSPM compliance was assessed by examining the dysphagia screen time as documented in the EMR admission history or admission orders. Patient intake and medication records were examined for times of food, fluids or medication intake and were compared to dysphagia screening times.

Additional data

Place of care delivery (i.e. stroke unit admission) and use of the EMR stroke orders, (neither were mandatory stroke registry data elements), were collected on a random sample of patients to examine CDS use and reasons for DSPM non-compliance.

Intervention

An EMR based CDS embedded in stroke admission orders with the following key components, (Online Supplement has details):

1. Dysphagia screening flowchart accessible through hyperlink (Figure 1). Currently, no consensus designated standard dysphagia screen tool exists (Daniels et al. 2012 online reference). Hence, the Figure 1 flowchart is institution specific and is not

being promoted as standard of care. Online Supplement discusses dysphagia screen design.

2. Hard stop dysphagia screening order to be completed before admission orders could be signed.
3. Default NPO diet which had to be unselected to choose a different diet option.
4. Prompt for documentation of dysphagia screening time and results in the EMR admission note.
5. The intervention went online in November 2009; providers were trained through December 2009.

Analysis

Patient characteristics and intervention outcomes were compared pre-intervention (year 2009) and post-intervention (years 2010-2011) using STATA IC 10 (StataCorp, College Station, TX, USA). Chi-square test or Fisher's exact test was used to determine statistical significance for categorical variables; student's t-test was used for continuous variables.

RESULTS

Between 2009 and 2011, the study hospital entered 1,387 acute events into the stroke registry. After exclusions, (361 TIAs/stroke mimics; 94 intubated or NPO throughout hospitalization), 952 events were included. Online table compares patient characteristics pre vs. post intervention.

There were significant differences in pre vs. post intervention DSPM compliance, (Table 1). Ischemic stroke compliance rose from 36% to 74%, (p=0.001). Hemorrhagic stroke compliance rose from 4% to 28%, (p=0.001).

Audit of a random sample of 50 charts from the post-intervention period revealed that screened patients were more likely to have been admitted to the stroke unit and/or had the CDS-embedded order set initiated (Table 2).

There was no difference in secondary patient outcomes including mean length of hospital stay, in-hospital mortality or pneumonia rates pre vs. post intervention.

DISCUSSION

The following was learned. First, the EMR offers a ready platform for CDS. EMR-based CDS for improving stroke care quality is still new. Despite multiple national stroke QI initiatives, reports of EMR-embedded CDS targeting stroke care are lacking. To our knowledge, the only similar report is an EMR-based "smart order set" for venous thrombo-embolism prophylaxis.[4]

CDS implementation was associated with improved DSPM compliance. Compliance was associated with order set usage and stroke unit admission. Non-compliance was higher when both factors were absent (Table 2). Despite the CDS, measure compliance remained imperfect. One reason for imperfect compliance was frequent change of providers at the study hospital, requiring repeated orientation to order sets and CDS usage.

Hemorrhagic strokes, typically admitted to surgical services without CDS admission order sets, showed poor DSPM compliance. Nevertheless, even in hemorrhagic strokes, measure compliance improved. A 2009 accreditation review at the study hospital identified DSPM

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compliance as an improvement area. Hence, hospital attention given to dysphagia screening in stroke patients may explain improved care quality in hemorrhagic strokes.

While our study showed significant intervention effect in the primary, process outcome, there was no improvement in secondary clinical outcomes of pneumonia or in-hospital mortality. Lack of statistical significance in secondary outcome rates may be explained by insufficient power to detect intervention effects and short hospital stays precluding detection of evolving pneumonia cases. In our prior work, unscreened patients had higher aspiration pneumonia rates than screened patients, (Reference online). Hinchey et al. (Reference online) found institutions with formal dysphagia screening protocols had lower pneumonia rates. Hence, interventions improving screening rates, such EMR-based CDS, will decrease pneumonia rates and improve outcomes.

We acknowledge our study is not a randomized-controlled trial (RCT). There is ongoing debate about the role of RCTs in evaluation of QI interventions.[5] While RCTs are the gold standard for evaluating simple therapeutic interventions (e.g. medication trials), the complexity of most QI interventions creates challenges for RCT design and implementation.[5] RCTs testing QI interventions evaluation are ideally resource intensive group randomized trials where the units of randomization are hospitals rather than individual patients.(References Online) In our study, as the CDS was a change in hospital ischemic stroke order sets, patients could not be randomizedhence all ischemic stroke patients received the intervention. Hemorrhagic stroke patients formed a natural concurrent control group since the CDS was not yet implemented in order sets used in their care.

We concur with experts[5] that QI intervention evaluation should use a wide range of methodologies. Our pre-post study design is commonly used in evaluating QI interventions; furthermore, we used a group of concurrent hemorrhagic stroke controls and undertook an additional evaluative step (Table 1) to understand the intervention's effectiveness and if other factors (e.g. stroke unit care) were facilitating measure compliance (Table 2).

Dysphagia screening is a difficult measure to improve based not only on our experiences with the MSR but also reported at a national level.[6] The CDS we describe has potential for improving this difficult measure.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

Funding

Supported by National Institutes of Health grant K23NS051377 to K.L. and MSR: Centers for Disease Control and Prevention: U58 DP000857.

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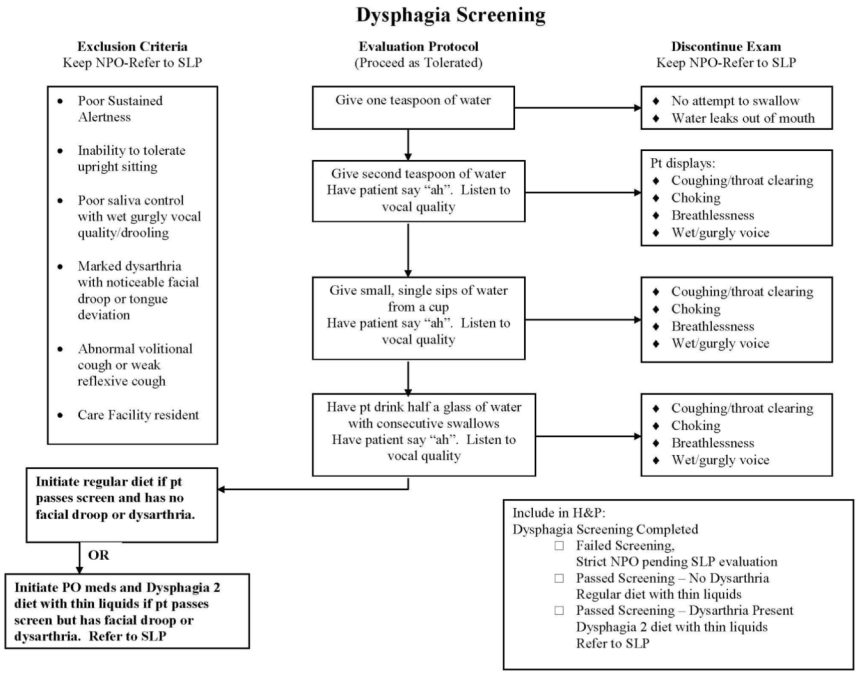

Figure 1.
Dysphagia screening flow chart accessible through a hyperlink in the order set.

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Table 1

Outcomes are pre- and post-implementation of Clinical Decision Support (CDS) orders for dysphagia screening. Primary outcome is compliance to dysphagia screening performance measure.

	N (%) Pre and Post CDS Intervention Total N = 952		
	Pre-CDS (N=369)	**Post-CDS (N=583)**	**P-value**
Primary Outcome			
Ischemic strokes (N=706)	101/278 (36)	316/428 (74)	0.001
Hemorrhagic strokes (N=246)	4/91 (4)	44/155 (28)	0.001
Secondary Patient Outcomes			
Length of stay, days mean(±SD)	6.6 (±6)	6.9 (±6)	0.7
In-hospital pneumonia	34 (9)	42 (7)	0.2
In-hospital mortality	31 (8)	32 (5)	0.07

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Table 2

Stroke order set use (with embedded dysphagia screening decision support) and stroke unit admissions for cases compliant with the dysphagia screen performance measure versus noncompliant cases. A random sample of 50 cases from year 2011 was examined.

	Dysphagia screen measure compliance		**P-value**
	Yes N=25	**No N=25**	
Stroke unit admission	16 (64)	8 (32)	0.04
Stroke order set initiated	22 (88)	10 (40)	0.001
No stroke unit admission AND No stroke order set initiated	1(0.04)	12(48)	0.001